AF/2642

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: WOLFRAM KLUGE DIETMAR EGGERT	Examiner: T. Knowlin
Serial No.: 09/904,751	Group Art Unit: 2642
Filed: July 13, 2001	Att'y Docket: 2000.066100
For: HARMONIC MIXER	Customer No. 023720

APPEAL BRIEF

CERTIFICATE OF MAILING
37 C.F.R. 1.8

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Kathy Manas (Signature)

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Commissioner of Patents
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Sir:

Applicants hereby submit this Appeal Brief to the Board of Patent Appeals and Interferences in response to the final Office Action dated June 17, 2005. A Notice of Appeal was filed on September 16, 2005 and so this Appeal Brief is believed to be timely filed.

The Commissioner is authorized to deduct the fee for filing this Appeal Brief ($500) from **Advanced Micro Devices, Inc.'s Deposit Account 01-0365/DE0028.**[1]

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[1] In the event the monies in that account are insufficient, the Director is authorized to withdraw funds from Williams, Morgan & Amerson, P.C. Deposit Account No. 50-0786/2000.066100.

I. REAL PARTY IN INTEREST

The present application is owned by Advanced Micro Devices, Inc. The assignment of the present application to Advanced Micro Devices, Inc., is recorded at Reel 12472, Frame 0496.

II. RELATED APPEALS AND INTERFERENCES

Applicant is not aware of any related appeals and/or interferences that might affect the outcome of this proceeding.

III. STATUS OF THE CLAIMS

Claims 1-12 are pending in the present application. Claims 1-12 stand rejected under 35 U.S.C. § 102(b) as allegedly being anticipated by Itoh, et al (U.S. Patent No. 5,787,126).

IV. STATUS OF AMENDMENTS

There were no amendments after the final rejections.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 1 sets forth a harmonic mixer including a multiplier circuit having first and second mixers. Independent claim 1 also sets forth a generator for generating two first and two second control signals for controlling said first and second mixers. The two first and two second control signals are balanced signals and are provided in four phases each shifted by $\pi/2$ in phase. The control signals have a frequency different from a frequency of a mixer input signal.

One embodiment of a harmonic mixer is shown in Figure 1. The illustrated mixer includes a switching network 10, a control signal generating means 20 and two output

operational amplifiers 17, 18. The control signal generating means 20 may be a VCO. The input signal 19 is an RF signal. The switching topology shown is a Gilbert cell providing a balanced architecture for the four control signals 21, 22, 23 and 24. The control signals include LO signals that are applied to all gates of the FETs in the mixer. The LO signals 21 and 22 applied to the gates of FETs 13 and 16 are balanced signals. Similarly, the LO signals 23 and 24 applied to the gates of FETs 11, 12 and 14, 15 are balanced signals. It has to be noted that signal 23 is applied to the gates of FETs 11 and 14 and signal 24 is applied to the gates of FETs 12 and 15. Additionally, as can be seen from Figure 1, the LO signals applied to the FET gates of mixing stage one and the LO signals applied to the FET gates of mixing stage two are shifted by 90 degrees in phase. All LO signals have the same frequency, however, the frequency is half the frequency of the input signal 19 and the LO signals are shifted by 90 degrees in phase. See Patent Application, page 10, line 3 – page 11, line 5 and Figure 1.

Independent claim 6 sets forth a harmonic direct conversion mixer for I/Q quadrature phase modulation that includes a first multiplier circuit having first and second mixers for generating inphase (I) components and a second multiplier circuit having third and fourth mixers for generating quadrature (Q) components. The harmonic direct conversion mixer also includes a generator for generating two first and two second control signals for controlling the first and second mixer and two third and two fourth control signals for controlling the third and fourth mixer. The two first, two second, two third and two fourth control signals are balanced signals. A phase shift of $\pi/2$ between the two first and two second control signals is provided. A phase shift of $\pi/2$ between the two third and two fourth control signals is provided. A phase shift of $\pi/4$ between the two first and two second control signals and the two third and two fourth control

signals is provided. The control signals have a frequency different from a frequency of a mixer input signal.

Figure 4 shows one exemplary embodiment of a circuit diagram of such an I/Q quadrature phase implementation of a mixer. This I/Q path realization includes a first Gilbert cell circuit 10 providing I - signals 40 and 41, a second Gilbert cell circuit 30 providing Q - signals 42 and 43, four output operational amplifiers 17, 18, 31 and 32 and means for generating control signals 20. The means for generating control signals 20 may comprise a VCO and preferably a filter bank. They provide four control signals 21, 22, 23 and 24 for the first Gilbert cell mixer and four control signals 25, 26, 27 and 28 for the second Gilbert cell mixer. The signals 21 and 22, 23 and 24, 25 and 26, 27 and 28 are in each case balanced. Hence, four control signals for the first Gilbert cell shifted by 90 degrees in phase and four control signals for the second Gilbert cell shifted by 90 degrees in phase are provided. Additionally, the control signals of the second Gilbert cell are shifted by 45 degrees relative to the control signals of the first Gilbert cell. All control signals have the same frequency, however, the control signal and VCO operation frequency is preferably half the frequency of the input signals.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Appellant respectfully requests that the Board review and overturn the single rejection present in this case. The following issue is presented on appeal in this case:

(A) Whether claims 1-12 are anticipated by Itoh.

VII. ARGUMENT

A. Legal Standards

An anticipating reference by definition must disclose every limitation of the rejected claim in the same relationship to one another as set forth in the claim. *In re Bond*, 15 U.S.P.Q.2d 1566, 1567 (Fed. Cir. 1990).

B. Claims 1-12 Are Not Anticipated by Itoh.

Itoh describes a harmonic quadrature mixer including two even harmonic mixers 40a and 40b. A zero-degree distributor 6 distributes first and second signals, which are equal in phase and magnitude, to the even harmonic mixers 40a and 40b, respectively. The first and second signals have the same frequency as received wave f_{rf}. The 45-degree phase shifter 42 provides third and fourth signals to the harmonic mixers 40a and 40b, respectively. The third and fourth signals have a frequency f_p that is different than the frequency of the received wave f_{rf} and are shifted in phase relative to one another by 45°, *i.e.* they have a phase difference of $\pi/4$. See Itoh, col. 9, ll. 9-27 and Figures 1 and 2.

However, contrary to the Examiner's allegations, Itoh does not describe or suggest two first and two second control signals provided in four phases each shifted by $\pi/2$ in phase. The first and second signals provided by the zero-degree distributor 6 have the same phase and frequency. The third and fourth signals are shifted in phase relative to one another by 45°, *i.e.* they have a relative phase difference of $\pi/4$. Furthermore, since the frequency of the first and second signals is different than the frequency of the third and fourth signals, there is no fixed phase relationship between the phases of the first and second signals and the phases of the third and fourth signals. Consequently, Applicants respectfully submit that Itoh fails to teach or

suggest that the first, second, third, and fourth signals provided in four phases each shifted by $\pi/2$ in phase, as set forth in independent claims 1 and 6.

Itoh also fails to teach or suggest two first and two second control signals having a frequency different from a frequency of a mixer input signal. As discussed above, the first and second signals have the same frequency as received wave f_{rf} and third and fourth signals have a frequency f_p that is different than the frequency of the received wave f_{rf}. Consequently, Applicants respectfully submit that Itoh fails to teach or suggest that the first, second, third, and fourth signals each have a frequency different that a mixer input signal, as set forth in independent claims 1 and 6.

For at least the aforementioned reasons, Applicants respectfully submit that the present invention is not anticipated by Itoh and request that the Examiner's rejections of claims 1-12 under 35 U.S.C. 102(b) be REVERSED.

VIII. CLAIMS APPENDIX

The claims that are the subject of the present appeal – claims 1-12 – are set forth in the attached "Claims Appendix."

IX. EVIDENCE APPENDIX

There is no separate Evidence Appendix for this appeal.

X. RELATED PROCEEDINGS APPENDIX

There is no Related Proceedings Appendix for this appeal.

XI. CONCLUSION

In view of the foregoing, it is respectfully submitted that the Examiner erred in not allowing all claims pending in the present application, claims 1-12, over the prior art of record. The undersigned may be contacted at (713) 934-4052 with respect to any questions, comments or suggestions relating to this appeal.

Respectfully submitted,

Date: 11/8/05

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AGENT FOR APPLICANTS

CLAIMS APPENDIX

1. A harmonic mixer comprising:

a multiplier circuit comprising first and second mixers; and

a generator for generating two first and two second control signals for controlling said first and second mixers,

wherein said two first and two second control signals are balanced signals and are provided in four phases each shifted by $\pi/2$ in phase, and

said control signals having a frequency different from a frequency of a mixer input signal.

2. The harmonic mixer of claim 1, wherein said multiplier circuit is a Gilbert cell having a plurality of transistors, where all said transistors are used as switches.

3. The harmonic mixer of claim 1, wherein said generator comprises a voltage controlled oscillator.

4. The harmonic mixer of claim 1, wherein the frequency of said control signals is half the frequency of the mixer input signal.

5. The harmonic mixer of claim 1, wherein said first mixer has a pair of field effect transistors and said second mixer has two pairs of field effect transistors.

6. A harmonic direct conversion mixer for I/Q quadrature phase modulation, comprising:

a first multiplier circuit comprising first and second mixers for generating inphase (I) components;

a second multiplier circuit comprising third and fourth mixers for generating quadrature (Q) components; and

a generator for generating two first and two second control signals for controlling said first and second mixer and two third and two fourth control signals for controlling said third and fourth mixer,

wherein said two first, two second, two third and two fourth control signals are balanced signals,

a phase shift of $\pi/2$ between said two first and two second control signals is provided,

a phase shift of $\pi/2$ between said two third and two fourth control signals is provided,

a phase shift of $\pi/4$ between said two first and two second control signals and said two third and two fourth control signals is provided, and

said control signals having a frequency different from a frequency of a mixer input signal.

7. The harmonic mixer of claim 6, wherein said first and second multiplier circuits each comprise a Gilbert cell having a plurality of transistors, where all said transistors are used as switches.

8. The harmonic mixer of claim 6, wherein said generator comprises a voltage controlled oscillator and a filter bank.

9. The harmonic mixer of claim 6, wherein the frequency of said control signals is half the frequency of the mixer input signal.

10. The harmonic mixer of claim 6, wherein said first and third mixers each comprise a pair of field effect transistors and said second and fourth mixers each comprise two pairs of field effect transistors.

11. The harmonic mixer of claim 8, wherein said filter bank comprises:

an initial $\pi/4$ phase shifter; and

first and second polyphase filters for generating said eight control signals.

12. The harmonic mixer of claim 11, wherein said $\pi/4$ phase shifter has first and second all-pass filters providing first and second differential signals shifted by $\pi/4$.